Matter and Motion Winter 2016
Chemistry Workshop 4

The workshop is intended to be a low-pressure setting where we get to practice problems, ask any questions, and discuss concepts and problem solving methods. Have fun! Work together on whiteboards or scratch paper and then neatly write your solutions in a notebook where you keep chemistry class notes. Your workshop solutions will be included in your portfolio.

1. You have solution of a weak acid HA and then add some salt NaA to it. What are the major chemical species in solution? Write the relevant chemical reactions. What do you need to know to calculate the pH of this solution? Is the pH of our solution higher, lower, or the same as a solution of only HA?

2. Calculate the pH of the following solutions:

a) 0.100 *M* $HONH_2$ (K_b = 1.1 x 10^{-8})

b) 0.100 *M* $HONH_3Cl$

c) pure H_2O

d) a mixture containing 0.100 *M* $HONH_2$ and 0.100 *M* $HONH_3Cl$

3. Calculate the pH of 1 L of each of the above solutions after the addition of 0.020 moles of HCl.

4. Let's say you have an unknown acid and want to find the Ka value. Before answering the following question, discuss with your group the strategy for finding Ka. Apply your lab experience in this discussion. Consider 75.0 mL of 0.10 *M* HA. After adding 30.0 mL of 0.10 *M* NaOH, the pH is 5.50. What is the K_a value of HA?

5. What is the purpose of an indicator for titrations? What is the difference between the end point and the equivalence (or stoichiometric) point? Consider a general indicator HIn (K_a = 1.0 x 10^{-9}) where HIn is yellow and In^- is blue. If the indicator is dropped in 100 mL of 0.10 *M* HCl, what is the color of the solution? Now start to titrate the solution with 0.10 *M* NaOH. At what pH will a color change occur? (NOTE assume a color change is visible when the less dominate form becomes 1/10 the concentration of the originally dominate species) What will the color of the solution appear to be at the color change? Finally, what color will the solution be after 200 mL NaOH has been added?